

Learning by doing in business education.

Using hackathons to improve the teaching and learning of entrepreneurial skills.

Abstract

Currently, the teaching of entrepreneurship skills is mostly dominated by strategical approaches that do not teach students evident examples of what happen in a real world company in terms of entrepreneurship. It is assumed that practical entrepreneurial skills are acquired at the university. Using a hackathon will put into practice and nurture entrepreneurial skills. This is the first study of its kind attempting to fill the gap in using hackathons and a set of practice-based pedagogical tools to teach entrepreneurial skills in UK business schools.

This paper sheds light on the issues associated with the use of hackathons to teach practice-based entrepreneurial skills to undergraduate students at a UK university. The study benchmarks the pedagogical tools currently used within the module to nurture entrepreneurial skills and how are used by the students participating in the hackathon.

The methodology to carry out this study is based on: academic performance indicators and a semi-structured interview with students, who have participated in the hackathon during the last four years. The information from the interviews is then analysed using NVivo.

Keywords: hackathon, entrepreneurship, teaching, Sync the City, practice-based

Introduction

This study will stress that the acquisition of entrepreneurial skills needs to be carefully nurtured in terms of practice and pedagogy within the classroom and out of it. A start-up hackathon competition puts into practice the knowledge acquired in the classroom.

This article is organised as follows: Section 1 presents the theoretical framework on the subject of practice-based teaching entrepreneurship. Section 2 examines the rise of teaching entrepreneurship at UK business schools. Section 3 presents the methodology used to examine the teaching of entrepreneurship using a hackathon. Section 4 tests the theoretical framework in Section 1 to see how it fits with the experience of a hackathon to teach students innovation and entrepreneurship.

Section 1. Theoretical Framework

There is a knowledge gap to assess the benefits or the lack of them in the practice-based teaching of entrepreneurship using hackathons. Although during the last 10 years hackathons have existed, there are not widely used to teach entrepreneurship and/or innovation. This study will be the first of its kind that produces academic literature on the teaching entrepreneurship using hackathons. It will also presents the theoretical underpinnings supporting the practice-based teaching. Notwithstanding, little has been done to make it mainstream within the delivery of modules in universities (Lea, 2015).

From the times of Greek philosophers such Aristotle, Plato and more recently in the *renaissance*, Descartes are the founding fathers of theoretical approaches and these have been followed by many business educators at universities worldwide. They highly ranked the acquisition of knowledge through the analysis of theories whereas the practice is regarded as an activity of low importance. Teaching entrepreneurship as a method involves a collaborative effort, which is the mantra promoted by Silicon Valley (Financial Times, 2018). Teamwork is key for successful companies.

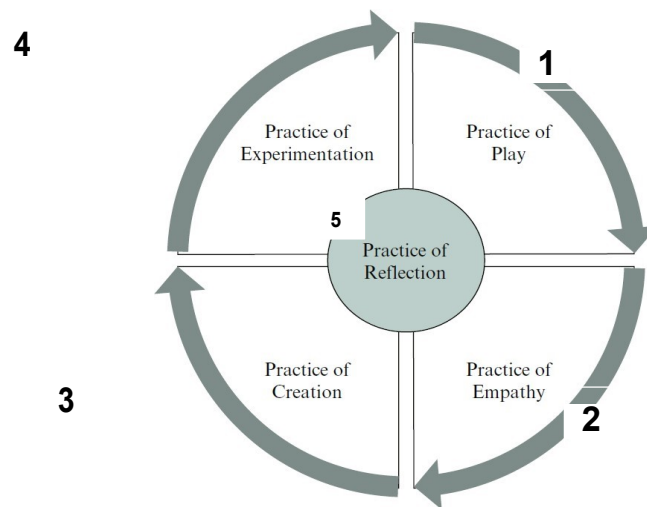
The practice-based approach is used to test and examine the information collected for this study. In fact, this approach is in itself a method to teach entrepreneurship at HEIs.

This study uses Neck et al (2014) framework to understand practice-based entrepreneurship to examine the hackathon (Sync the City) in order to provide evidence that this can be of help for those teaching entrepreneurial skills. The framework comprises five areas as presented below figure.

1.1 Practice of Play

It involves a conscious activity with some rules not connected to material interest, which can be serious or playful to absorb the player into it through a collaborative effort. Key examples suggested by Neck et al. (2014) in HEIs: puzzles, computer simulations, problem solving exercises, improvisation exercises to cultivate the entrepreneurial mind-set or idea generation and creativity, spaghetti tower, elevator pitch and business model canvas.

Figure 1.1. Key components of the practice-based teaching entrepreneurship



Source: adopted from Neck, H.M. et al. (2014)

1.2 Practice of empathy

Decety and Jackson (2004) define empathy as “the naturally occurring subjective experience of similarity between the feelings expressed by self and others without losing sight of whose feelings belong to whom.” However, these experiences might appear empty if they are not linked to a goal. Thus, Simon (1996) and Patnaik (2009) translated empathy into the teaching of business as the idea of design thinking as the core of how teams collaborate successfully within organisations. Neck et al (2014) propose examples of *Practice of Empathy*: observation exercise (object or activities), negotiation for resource acquisition, peer coaching, interviewing an entrepreneur or business leader, team management and role play.

Through the practice of empathy, students are able to relate in a better way with people they are working with. This activity is intrinsically related to communication and creativity skills. If the latter two are practiced, then the likelihood that a project positively evolve might increase (Tofteland, 2015). The lack of empathy may lead to the team members to create silos of knowledge. Tofteland (2015) states that the nurture of empathy have a positive effect in develop the creative process. However, he argues that these two aspects are not necessarily hand in hand. In fact, empathy is not natural in humans, it needs to be learned.

1.3 Practice of creation

According to Kozbelt et al. (2010), practice of creation has two aspects. i) Problem-solving where creativity is viewed as more rational and empirical. Students are guided to areas complementing their capabilities, while the instructor’s role is to facilitate self-understanding

and assist in structuring the creative investigation. Creativity in this form is more of a longer-term practice, because it involves deliberate search. *ii) Problem-finding* and design thinking takes place where students need to learn how to observe, listen, and carefully record their observations. The instructor facilitates by encouraging students to utilize all senses, without jumping to ideas too quickly (Csikszentmihalyi, 1996).

Examples of *Practice of Creation* are: mind dumping for ideation, brainstorming, lateral thinking exercises), future trends and entrepreneurial opportunities, resource acquisition games, building strategic alliances and resource challenge (Neck et al., 2014).

1.4 Practice of experimentation

When several pieces of knowledge are acquired within a social context the concatenation of all these experiences might produce an idea, a creative process making sense of producing something new with the pieces of knowledge already in the students' brains. The practice of experimentation follows the constructionist view of teaching, which assumes that humans interact in their environment to gain knowledge by applying, discovering, and extending it (Zahorik, 1995). It is through these experiences that the knowledge is acquired, tested, confronted and criticised. As Duffy (1995) claims it, learning is enacted reality and part of a social construction.

Practice of Experimentation key examples are: feasibility exercises, competitive cup stacking, reduction of risks exercises with low cost experiments, opportunity screening, fear of failure (quizzes), predictive vs creative thinking and experiments with low resources (Neck et al., 2014).

1.5 Practice of reflection

The critical importance of practice in entrepreneurial education has emerged strongly over the last half-century. Dewey (1916) key contribution is that education should focus not only on things but on the relations and connections between things. This kind of skills are well established in practice-oriented disciplines within universities such as medicine, nursery, and education. Dewey's approach (1916) brings us firmly back to our goal of synthesis and of needing both theory and practice and the use of reflection to connect the two by presenting reflection as a pathway to direction and guidance. His approach looks at reflective practice of deciding how content should be delivered in the most powerful way as to really make a lasting impression upon the minds of students.

It is in-group or individually that the reflective learning delivers the best outcomes. Brockbank and McGill (2007) locate reflective learning in the social sphere by defining reflective learning as an intentional social process, where context and experience are acknowledged, in which learners are active individuals, present, engaging with others, open to challenge and the outcomes involve transformation as well as improvement for both individuals and their environment”, i.e. do–learn–think as a process and reflection-in-practice, (Schön, 1987). Practice of reflection examples are: critical thinking, reflecting on entrepreneurial experience, creating culture, identifying passion in entrepreneurs, opportunity walks (Neck et al., 2014). Next Section presents the rise of practice-based teaching of entrepreneurship.

Section 2

The context of practice-based teaching of entrepreneurship in HEIs

Since 2007 OECD delivers material and support to their member states training packages on how to transform higher education into innovative organisations with emphasis on entrepreneurship (OECD, 2018). Several OECD studies (2010a,b and 2011, 2012) have stressed the need to establish an entrepreneurship policy framework to facilitate: access to financial resources, reduction of taxes and administrative procedures and access educational resources.

During the last forty years, entrepreneurship has been associated with company creation, especially by young individuals (GUESS, 2016) and (Chrisman et al., 1995). HEI institutions have started to develop entrepreneurship programmes and courses to meet the rise on the demand.

Strangely, it is thought by many that the teaching of many business related subjects in UK universities would involve work in companies. Nevertheless, the teaching of entrepreneurship has neglected the practical component and focus on purely strategic thinking where the teaching practices are related for instance, to forecast demand, costs, strategies and creating business models without considering human factors (Kalar and Antoncic, 2015). The UK Higher education environment has recently changed in terms of providing prospective students with a “real” work experience in the UK or abroad of one semester to up to one year (Financial Times, 2018) and World Economic Forum (2018).

2.1 Universities and Business Schools teaching entrepreneurship

GUESSS (2014) and OECD (2018) has stressed that the role of universities promoting and doing entrepreneurship should include: i) practice within companies and organisations that the university has facilitated in the form of placements. ii) part of the educational process needs to take place outside classrooms.

What Uni? (2018) report shows that currently there are 37 universities in the UK offering entrepreneurship degrees at BSc, BA or MSc level. That is, around 23% of Higher education institutions. Therefore, we can assume that at the majority of HEI in the UK offer at least a module related to entrepreneurship. According to Universities UK (2018), in 2015–16, 3890 new graduate start-ups were created; 150 new university-owned or part-owned spin-off companies were created.

GUESSS (2014) states that industry collaboration with higher education institutions increases productivity by 11 and 16% (GUESSS, 2014). According to Innovate UK (2018) and (Guerrero, et al., 2015) and Rogers (2017) there are over 100 university science and enterprise parks in the UK and most of them hosts a highly ranked university.

2.2 Hackathons as a tool to teach practice-based entrepreneurship

According to the Oxford dictionary (2018), a hackathon is an event, typically lasting several days, in which a large number of people meet to engage in collaborative computer programming.

Universities such as Cornell, UCLA, Stanford, MIT, Caltech and North-Western among other are embracing the teaching of entrepreneurship to their students. Above highly ranked universities, have a long trajectory and reputation of practice-based teaching entrepreneurship. In the UK, salient examples of business - academia interactions are found in Cambridge, Oxford and Manchester. However, new towns/cities have become very innovative in very short time. Moreover, private companies such as Hackathon.com (2018) have started since more than 10 years ago the creation of hackathons where they charge a fee to participants. (Lin, 2018) has categorised hackathon as follows: **For prestige:** PennApps, HackMIT, HackNY, YC Hacks. **For fun:** HackIllinois, BoilerMake, BitCamp, HackTX, Hack@Brown. **For no-programmers/Practice:** Design & Hack and Startup Weekends Worldwide and **for the crowd:** MHacks, LAHacks and HackTech.

Important to notice is that there is no worldwide hackathon in Europe, most of the prestigious ones occur in United States.

Students attempting to discover their entrepreneurial potential, which is commonly associated with below factors already identified by fear, no appetite for chaos, a preference for judging over generating ideas, a dislike for incubating ideas and a perceived lack of challenge. Specifically, the UK started to lag behind compared to other educational systems in Europe. For instance, the German educational system is the most mature in promoting entrepreneurship, enterprise in student and include it in the course they offer not only in business studies but in general delivery of HEI courses and programmes (Thomas and Mueller, 2000).

Section 3. Research Methodology

An initial objective of the research methodology is to fill the knowledge vacuum related to contemporary ways of teaching entrepreneurship in the UK and to compare them to previous methods based on theory.

In order to examine this gap in the research, it is planned to carry out a study considering the event Sync the City during the last four years. This researcher has taken students in the module Innovation Management to the Sync the City event and be fully involved in the entrepreneurial experience. The module Innovation Management (NBS-6012A) does not specifically teach entrepreneurship. However, Innovation has a key relationship with entrepreneurship, as one cannot act for itself, both sets of knowledge working in symbiosis.

3.1 Methodological Techniques Employed

The first technique involves a dataset of student performance indicators.

- i) Students' marks during the last four years in the module Innovation Management (NBS-6012A).
- ii) module evaluations of Innovation Management (NBS-6012A) in the last six years
- iii) students attendance in the last six years in the module Innovation Management in the last six years
- iv) Number and relevance of the participants attending the event Sync the City in the last four years.
- v) Attendance to the event is monitored by the lecturer, students have been made aware that attendance to the event Sync the City is mandatory.
- vi) How many students sign up for the module and how many were accepted.

The student performance indicators aimed at producing ideas about student disposition to the module.

The second research technique involves a semi-structured interview conducted with six previous students in the module Innovation Management. These individuals participated in the event Sync the City in different years.

The qualitative information contained within the interview was sampled using NVivo version 11 Pro. The qualitative interviews aimed at assessing the practice-based teaching of entrepreneurship framework presented in Section 1. Informants were identified by using LinkedIn and email (if the email address was provided by the former students). The decision to use open-ended questions was based on evidence suggesting that, in network environments, these types of questions tend to produce longer and more honest responses, which would allow deeper exploration of several issues of key importance (Oppenheim 1992).

Three interviews were conducted over the phone and two were face-to-face on the basis of semi-structured questions. Each interview lasted for approximately one hour. One of NVivo features used to examine the qualitative information collected will be **word cloud** to examine interviewees' perceptions.

Next section presents the findings and discussion to examine the key process involved in the practice-based teaching of entrepreneurship.

Section 4. Research Findings and Discussion

4.1 Quantitative analysis

This study comprises the analysis of 4 quantitative indicators.

i) The average marks have increased marginally since the inclusion of the hackathon for teaching purposes. However, the average marks in those years are significantly higher than the average for all modules in Year 3. ii) Module evaluations in the last six years have been very good with an average of 4.4 out of 5. iii) Students attendance in the last four years has been above 75% in average (UEA LTS Blackboard, 2018).

Table below shows the diversity and number of participants in Sync the City.

Table 4.1 Number and remit of the participants attending the event Sync the City

		2014	2015	2016	2017
	Participant Total	65	111	98	95
Participant Breakdown	No. of Developers	30	40	51	49
	No. of Non-technical/business	29	48	24	28
	No. of Designers	6	23	23	18
	No. of students	26	55	49	37
	No. of non-students	39	56	49	58
	No. of UEA representatives	27	36	22	21
	No. of private sector companies	18	13	14	16

Source: UEA Careers' Office

The judges in the hackathon come from business, technological or a combination of both sectors. iv) During the last four years there has been an increasing demands from students to take the module. However, not all of them have been accepted.

4.2 Qualitative analysis (semi-structured interviews)

This study comprises six interviews on 18 questions related to their participation in the event Sync the City.

Table 4.2 Number of interviewees per year of study

Academic year	Number of interviewees	Pseudonym	Current status	School at UEA
2014-2015	One	Poppy	working	NBS
2015-2016	Three	Sarah, Louis and Giulia	Working and completing masters degrees respectively	CMP, NBS, NBS
2016-2017	None	None	None	None
2017-2018	Two	Terry and Tian	Completing undergraduate degrees	NBS

Interviews analysis

The analysis of interviews was organised following Neck et al (2014) analytical framework presented in Section 1: play, empathy, creation, experimentation, and reflection.

4.2.1 Practice of Play

Five out of six participants in Sync the City, considered that the event was a serious game/experience. However, even though it was a serious experience, students still considered a game to learn from.

Practice of *Play* (1) in the teaching of the Innovation Management module has made use of resources: role-play, use of Audience Response Systems (ARS) for competitions, computer simulations, spaghetti tower, elevator pitch and hackathon competition sponsored by a regional company, which have been very successful in cultivating the entrepreneurial mind-set. The resources employed have created a safe educational environment where students start nurturing entrepreneurial skills. Neck et al (2014) argue that by creating a safe environment (where the students can feel safe to do mistakes), they are more willing to improve on what is taught inside and outside the classroom. However, the lecturer has a large responsibility in creating this environment in order to succeed in the delivery of knowledge.

The implications for teaching is to develop a safe environment is key for learning entrepreneurship. The educator needs to constantly work to maintain it. Therefore, monitoring students' attendance and engagement in the classroom and at the event is important. When students detach or go away from the learning environment the capacity to learn diminishes. It is necessary to spend some minutes every lecture and seminar to inform the students about the learning objective (s) related to the activity in question. As Neck et al (2014) have stated, by familiarising and fully informing the student the purpose of the exercises they will be more willing to be involved and fully participating in the activity. By experiencing enjoyment, students are more able to deliver as much as they can academically and personally.

Furthermore, students will gain entrepreneurial skills if other modules at the business school during the first two years of the degree promoting these skills.

4.2.2 Practice of Empathy

All interviewees agreed that they have improved empathy using communication skills.

All three informants stated that they carried out research activities during the event specifically market research, which is useful to develop the app and to realise that the idea had commercial

potential. The market research involved carrying out survey questionnaires and interviews with potential customers or users of the app.

Further, all interviewees agreed that they carried out communication activities largely in order to ensure that every single person within the team was doing the correct activity at the correct time. It is observed that in order to create a good app, the participants need to develop empathy skills, which go in hand with good communication between the team members.

Figure 4.1. Word cloud related to empathy answers



Source: Nvivo

Practice *Empathy* tools are: role-play, negotiation games, external speakers and spaghetti tower. These exercises establish a rapport between the students and external persons invited to the classroom or when practicing role-playing in a business setting (Belbin, 2010), students are able to identify novel opportunities and risks associated to the problem examined in the seminars. According to Neck et al (2014) framework, this activity is intrinsic to any human skill involving a great deal of communications in order to increase the project chances of success and it is key importance to many activities related to entrepreneurship.

Neck et al. (2014) have stated that lack of empathy may lead to members of the team to create silos of knowledge and skills and eventually polarisation of the team, which at the end created an overall negative outcome for all the team members as some skills have not been fully exploited. Initial efforts should be made to make them part of a visible curriculum instead of finding them in exercises during the first two years of the degree.

4.2.3 Practice of Creation

The creation component was experienced by all of the interviewed individuals realised what are they capable of in different skill sets. Sync the City event was a problem solving activity to all informants, i.e. the creation of an app.

All interviewees mentioned that they used entrepreneurial skills during the event Sync the City. Further, all participants in this study agreed that they did not find any barrier for their innovative and entrepreneurial learning.

Practice of *Creation* during the Innovation Management module uses 4 tools used in the classroom: role play, spaghetti tower, building strategic networks/alliances and mix of summative assessment tools. Not surprisingly the majority of interviewees perceived that they were not creative individuals, they have arrived to that conclusion because before taking the module Innovation Management no lecturer has made them aware they possess or not creativity skills. The majority of interviewees assert they possess problem-solving skills as that is a key feature of the manager profession. However, they initially fail to conceive that the managerial profession is not only to solve problems but also to find problems to be solved. In fact, this is one of the key skills sought by multi-national corporations hiring graduates, which in most of the cases are not business students but from humanities (THE, 2016).

Moreover, Neck et al. (2014) assert that it is important to nurture these skills to untap the student mental potential to succeed in business. Possession of these skills related to creativity can make their future jobs more enjoyable and productive. It is very important to make students aware from the beginning of their degrees if they are creative individuals. A basic voluntary creativity test can be completed by the students to make them aware of their possession would be an initial step. If a student is a creative person, it necessary to coach her/him or to provide advice on how to continue nurturing the skill within the university or outside of it.

4.2.4 Practice of Experimentation

Three out of six interviewees led a team and presented a pitch in Sync the City. Above three interviewees coincided that leading a team was extremely stressful and at the same time highly rewarding. Interviewees stated that were able to practise the skills gained and enhance in Sync the City in a classroom, all of them stated that it would not be possible to practice entrepreneurial skill only in a classroom. Overall, interviewees mentioned that they realised that their idea was successful from the enthusiasm and work with other team members during the event.

Tools used in the module related to entrepreneurial skills are: external speakers, computer simulations, problem solving exercises, spaghetti tower, elevator pitches, business model

The entrepreneurial skills mostly used and nurtured in Sync the City by interviewees were: leadership, negotiation, team working and communications skills.

Figure 4.5 Answers on practice on refection's word cloud



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Moreover, it is important to consider the views of the interviewees from the Anglo-Saxon context in the learning of entrepreneurial skills as they are more likely to understand and engage in the learning of such skills. Conversely, international students take a bit longer to process and take interest in the acquisition of these skills.

Concluding Remarks

Considering the evidence presented in this study several conclusions arise.

- i) The teaching of entrepreneurial skills is not common in UK universities. More efforts, especially academic need to be carried out to transform this subject into something useful for students.
- ii) By applying theoretical traits related to the implementation of teaching entrepreneurship by Neck et al (2014) provides an excellent boost to modules wishing to practice-based teach entrepreneurship. As Marton (1975) stated, as educators, we want our students to learn and not just on the surface, but in a deep, sustained, and meaningful manner.
- iii) The use of hackathons to teach entrepreneurship is key to boost student interest in the subject as well as to increase better outcomes for students after they have completed a degree. For instance, getting access to better-paid jobs, finding less difficulty to find opportunities to continue their professional development, improve their entrepreneurial skills needed for any job in different industries.
- iv) A hackathon by itself nurtures a large number of entrepreneurial skills presented by Neck et al (2014) and examined in this study.
- v) Adopting a practice-based approach to teach entrepreneurship is a labour intensive task compared to a traditional method. However, the benefits for the students and in reputational terms for the institution are enormous.

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Abstract

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Keywords: hackathon, entrepreneurship, teaching, Sync the City, practice-based

1. Introduction

Current teaching of innovation and entrepreneurship in Higher Education Institutions worldwide follow a strategic (theory-based) approach to teach students on the subjects. A very small number of highly ranked universities, mainly in America have consolidated new pedagogical methods to teach business related subjects to their students. These methods are based on practice in companies to reinforce the theoretical concepts learned in the classroom. Notwithstanding the latter, the diffusion of such practices has had a very sluggish diffusion in many areas of the world. There is an urgent need for UK business schools to establish successful and sustainable relationships with the organisations that will receive their future graduates. These should possess the relevant skills and knowledge to support the development of the companies and organisations hiring them.

This study will stress that the acquisition of entrepreneurial skills needs to be carefully nurtured in terms of practice and pedagogy within the classroom and out of it. A start-up hackathon competition puts into practice the knowledge acquired in the classroom.

This article is organised as follows: Section 1 presents the theoretical framework about practice-based teaching entrepreneurship. Section 2 examines the rise of teaching entrepreneurship at UK business schools. Section 3 presents the methodology used to examine the teaching of entrepreneurship by employing a hackathon. Section 4 tests the theoretical framework in Section 1 to see how it fits with the experience of a hackathon to teach students innovation and entrepreneurship.

2. Theoretical Framework

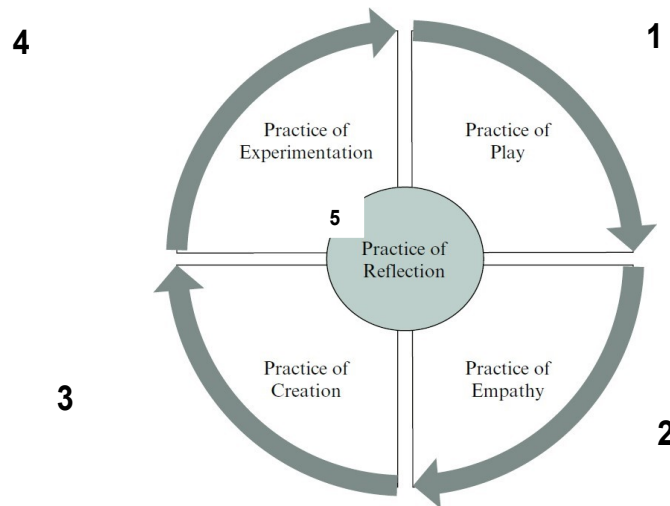
There is a knowledge gap to assess the benefits or the lack of them in the practice-based teaching of entrepreneurship using hackathons. Although during the last 10 years hackathons have existed, there are not widely used to teach entrepreneurship and/or innovation. This study will be the first of its kind that produces academic literature on the teaching entrepreneurship using hackathons. It will also present the theoretical underpinnings supporting the practice-based teaching. Notwithstanding, little has been done to make it mainstream within the delivery of modules in universities, (Lea, 2015).

From the times of Greek philosophers such Aristotle, Plato and more recently in the *renaissance*, Descartes are the founding fathers of theoretical approaches and these have been followed by many business educators at universities worldwide. They highly ranked the acquisition of knowledge through the analysis of theories whereas the practice is regarded as an activity of low importance. Teaching entrepreneurship as a method involves a collaborative effort, which is the mantra promoted by Silicon Valley (Financial Times, 2018). Teamwork is key for successful companies.

The practice-based approach is used to test and examine the information collected for this study. In fact, this approach is a method to teach entrepreneurship at Higher Education Institutions (HEIs). This study uses Neck et al (2014) framework to understand practice-based entrepreneurship to examine the hackathon (Sync the City) in order to provide evidence that this can be of help for those teaching entrepreneurial skills. The framework comprises five areas as presented in Figure 1.

2.1 Practice of Play

It involves a conscious activity with some rules not connected to material interest, which can be serious or playful to absorb the player into it through a collaborative effort. Key examples suggested by Neck et al. (2014) in HEIs: puzzles, computer simulations, problem solving exercises, improvisation exercises to cultivate the entrepreneurial mind-set or idea generation and creativity, spaghetti tower, elevator pitch and business model canvas.



Source: adopted from Neck, H.M. et al. (2014)

Figure 1. Key components of the practice-based teaching entrepreneurship

2.2 Practice of empathy

Decety and Jackson (2004) define empathy as “the naturally occurring subjective experience of similarity between the feelings expressed by self and others without losing sight of whose feelings belong to whom”. However, these experiences might appear empty if they are not linked to a goal. Thus, Simon (1996) translated empathy into the teaching of business as the idea of design thinking as the core of how teams collaborate successfully within organisations. Neck et al (2014) propose examples of *Practice of Empathy*: observation exercise (object or activities), negotiation for resource acquisition, peer coaching, interviewing an entrepreneur or business leader, team management and role play.

Through the practice of empathy, students are able to relate in a better way with people they are working with. This activity is intrinsically related to communication and creativity skills. If the latter two are practiced, then the likelihood that a project positively evolve might increase (Tofteland, 2015). The lack of empathy may lead to the team members to create silos of knowledge. Tofteland (2015) states that the nurture of empathy has a positive effect in develop

the creative process. However, he argues that these two aspects are not necessarily hand in hand. In fact, empathy is not natural in humans, it needs to be learned.

2.3 Practice of creation

According to Kozbelt et al. (2010), practice of creation has two aspects. i) Problem-solving where creativity is viewed as more rational and empirical. Students are guided to areas complementing their capabilities, while the instructor's role is to facilitate self-understanding and assist in structuring the creative investigation. Creativity in this form is more of a longer-term practice, because it involves deliberate search. ii) *Problem-finding* and design thinking takes place where students need to learn how to observe, listen, and carefully record their observations. The instructor facilitates by encouraging students to utilize all senses, without jumping to ideas too quickly (Csikszentmihalyi, 1996).

Examples of Practice of Creation are: mind dumping for ideation, brainstorming, lateral thinking exercises, future trends and entrepreneurial opportunities, resource acquisition games, building strategic alliances and resource challenge (Neck et al., 2014).

2.4 Practice of experimentation

When several pieces of knowledge are acquired within a social context the concatenation of all these experiences might produce an idea, a creative process making sense of producing something new with the pieces of knowledge already in the students' brains. The practice of experimentation follows the constructionist view of teaching, which assumes that humans interact in their environment to gain knowledge by applying, discovering, and extending it (Zahorik, 1995). It is through these experiences that the knowledge is acquired, tested, confronted and criticised. As Duffy (1995) claims it, learning is enacted reality and part of a social construction.

Practice of Experimentation key examples are: feasibility exercises, competitive cup stacking, reduction of risks exercises with low cost experiments, opportunity screening, fear of failure (quizzes), predictive vs creative thinking and experiments with low resources, (Neck et al., 2014).

2.5 Practice of reflection

The critical importance of practice in entrepreneurial education has emerged strongly over the last half-century. Dewey (1916) key contribution is that education should focus not only on things but on the relations and connections between things. This kind of skills are well

established in practice-oriented disciplines within universities such as medicine, nursery, and education. Dewey's approach brings us firmly back to our goal of synthesis and of needing both theory and practice and the use of reflection to connect the two by presenting reflection as a pathway to direction and guidance. His approach looks at reflective practice of deciding how content should be delivered in the most powerful way as to really make a lasting impression upon the minds of students.

It is in-group or individually that the reflective learning delivers the best outcomes. Brockbank and McGill (2007) locate reflective learning in the social sphere by defining reflective learning as an intentional social process, where context and experience are acknowledged, in which learners are active individuals, present, engaging with others, open to challenge and the outcomes involve transformation as well as improvement for both individuals and their environment", i.e. do-learn-think as a process and reflection-in-practice, (Schön, 1987). Practice of reflection examples are: critical thinking, reflecting on entrepreneurial experience, creating culture, identifying passion in entrepreneurs, opportunity walks; (Neck et al., 2014). Next Section presents the rise of practice-based teaching of entrepreneurship.

3. The context of practice-based teaching of entrepreneurship in HEIs

Since 2007 OECD delivers material and support to their member states training packages on how to transform higher education into innovative organisations with emphasis on entrepreneurship OECD (2018). Several OECD studies (2010 a,b and 2011 a,b, 2012) have stressed the need to establish an entrepreneurship policy framework to facilitate: access to financial resources, reduction of taxes and administrative procedures and access educational resources.

During the last forty years, entrepreneurship has been associated with company creation, especially by young individuals; GUESSE (2016) and Chrisman et al. (1995). HEI institutions have started to develop entrepreneurship programmes and courses to meet the rise on the demand.

Strangely, it is thought by many that the teaching of many business-related subjects in UK universities would involve work in companies. Nevertheless, the teaching of entrepreneurship has neglected the practical component and focus on purely strategic thinking where the teaching practices are related for instance, to forecast demand, costs, strategies and creating business

models without considering human factors; (Kalar and Antoncic, 2015). The UK Higher education environment has recently changed in terms of providing prospective students with a “real” work experience in the UK or abroad of one semester to up to one year; (Financial Times, 2018) and (World Economic Forum, 2018).

3.1 Universities and Business Schools teaching entrepreneurship

GUESSS (2016) and OECD (2018) has stressed that the role of universities promoting and doing entrepreneurship should include: i) practice within companies and organisations that the university has facilitated in the form of placements. ii) part of the educational process needs to take place outside classrooms.

What Uni? (2018) report shows that currently there are 37 universities in the UK offering entrepreneurship degrees at BSc, BA or MSc level. That is, around 23% of Higher education institutions. Therefore, we can assume that at the majority of HEI in the UK offer at least a module related to entrepreneurship. According to Universities UK (2018), in 2015–16, 3890 new graduate start-ups were created; 150 new university-owned or part-owned spin-off companies were created.

GUESSS (2016) states that industry collaboration with higher education institutions increases productivity by 11 and 16%. According to Innovate UK (2018), Guerrero, et al. (2015) and Rogers (2017) there are over 100 university science and enterprise parks in the UK and most of them hosts a highly ranked university.

3.2 Hackathons as a tool to teach practice-based entrepreneurship

According to the Oxford dictionary (2018), a hackathon is an event, typically lasting several days, in which many people meet to engage in collaborative computer programming.

Universities such as Cornell, UCLA, Stanford, MIT, Caltech and North-Western among other are embracing the teaching of entrepreneurship to their students, Barry, 2016. Above highly ranked universities have a long trajectory and reputation of practice-based teaching entrepreneurship.

In the UK, salient examples of business - academia interactions are found in Cambridge, Oxford and Manchester. However, new towns/cities have become very innovative in very short time. Moreover, private companies such as Hackathon.com (2018) have started since more than 10 years ago the creation of hackathons where they charge a fee to participants. Lin (2018) has categorised hackathon as follows: **For prestige:** PennApps, HackMIT, HackNY, YC Hacks.

For fun: HackIllinois, BoilerMake, BitCamp, HackTX, Hack@Brown. **For no-programmers/Practice:** Design & Hack and Startup Weekends Worldwide and **for the crowd:** MHacks, LAHacks and HackTech.

Important to notice is that there is no worldwide hackathon in Europe, most of the prestigious ones occur in United States.

Students attempting to discover their entrepreneurial potential, which is commonly associated with below factors already identified by fear, no appetite for chaos, a preference for judging over generating ideas, a dislike for incubating ideas and a perceived lack of challenge. Specifically, the UK started to lag behind compared to other educational systems in Europe. For instance, the German educational system is the most mature in promoting entrepreneurship, enterprise in student and include it in the course they offer not only in business studies but in general delivery of HEI courses and programmes, (Thomas and Mueller, 2000).

4. Research Methodology

An initial objective of the research methodology is to fill the knowledge vacuum related to contemporary ways of teaching entrepreneurship in the UK and to compare them to previous methods based on theory.

In order to examine this gap in the research, it is planned to carry out a study considering the event Sync the City during the last four years. This researcher has taken students in the module Innovation Management to the Sync the City event and be fully involved in the entrepreneurial experience. The module Innovation Management (NBS-6012A) does not specifically teach entrepreneurship. However, Innovation has a key relationship with entrepreneurship, as one cannot act for itself, both sets of knowledge working in symbiosis.

4.1 Methodological Techniques Employed

The first technique involves a dataset of student performance indicators.

- i) Students' marks during the last four years in the module Innovation Management (NBS-6012A).
- ii) module evaluations of Innovation Management (NBS-6012A) in the last six years
- iii) students attendance in the last six years in the module Innovation Management in the last six years.

iv) Number and relevance of the participants attending the event Sync the City in the last four years.

v) Attendance to the event is monitored by the lecturer, students have been made aware that attendance to the event Sync the City is mandatory.

vi) How many students sign up for the module and how many were accepted.

The student performance indicators aimed at producing ideas about student disposition to the module.

The second research technique involves a semi-structured interview conducted with six previous students in the module Innovation Management. These individuals participated in the event Sync the City in different years. The qualitative information contained within the interview was sampled using NVivo version 11 Pro. The qualitative interviews aimed at assessing the practice-based teaching of entrepreneurship framework presented in Section 1. Informants were identified by using LinkedIn and email (if the email address was provided by the former students). The decision to use open-ended questions was based on evidence suggesting that, in network environments, these types of questions tend to produce longer and more honest responses, which would allow deeper exploration of several issues of key importance, (Creswell, 2018).

Three interviews were conducted over the phone and two were face-to-face based on semi-structured questions. Each interview lasted for approximately one hour. One of NVivo features used to examine the qualitative information collected will be **word cloud** to examine interviewees' perceptions.

Next section presents the findings and discussion to examine the key process involved in the practice-based teaching of entrepreneurship.

5. Research Findings and Discussion

5.1 Quantitative analysis

This study comprises the analysis of 4 quantitative indicators.

i) The average marks have increased marginally since the inclusion of the hackathon for teaching purposes. However, the average marks in those years are significantly higher than the average for all modules in Year 3. ii) Module evaluations in the last six years have been very

good with an average of 4.4 out of 5. iii) Students attendance in the last four years has been above 75% in average (UEA LTS Blackboard, 2018).

Table 1 shows the diversity and number of participants in Sync the City.

		2014	2015	2016	2017
	Participant Total	65	111	98	95
Participant Breakdown	No. of Developers	30	40	51	49
	No. of Non-technical/business	29	48	24	28
	No. of Designers	6	23	23	18
	No. of students	26	55	49	37
	No. of non-students	39	56	49	58
	No. of UEA representatives	27	36	22	21
	No. of private sector companies	18	13	14	16

Source: UEA Careers' Office

Table 1. Number and remit of the participants attending the event Sync the City

The judges in the hackathon come from business, technological or a combination of both sectors. iv) During the last four years there has been an increasing demands from students to take the module. However, not all of them have been accepted.

5.2 Qualitative analysis (semi-structured interviews)

This study comprises six interviews on 18 questions related to their participation in the event Sync the City.

Academic year	Number of interviewees	Pseudonym	Current status	School at UEA
2014-2015	One	Poppy	working	NBS
2015-2016	Three	Sarah, Louis and Giulia	Working and completing masters degrees respectively	CMP, NBS, NBS
2016-2017	None	None	None	None

2017-2018	Two	Terry and Tian	Completing undergraduate degrees	NBS
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Table 2. Number of interviewees per year of study

Interviews analysis

The analysis of interviews was organised following Neck et al (2014) analytical framework presented in Section 1: play, empathy, creation, experimentation, and reflection.

5.2.1 Practice of Play

Five out of six participants in Sync the City, considered that the event was a serious game/experience. However, even though it was a serious experience, students still considered a game to learn from.

Practice of *Play* (1) in the teaching of the Innovation Management module has made use of resources: role-play, use of Audience Response Systems (ARS) for competitions, computer simulations, spaghetti tower, elevator pitch and hackathon competition sponsored by a regional company, which have been very successful in cultivating the entrepreneurial mind-set. The resources employed have created a safe educational environment where students start nurturing entrepreneurial skills. Neck et al (2014) argue that by creating a safe environment (where the students can feel safe to do mistakes), they are more willing to improve on what is taught inside and outside the classroom. However, the lecturer has a large responsibility in creating this environment in order to succeed in the delivery of knowledge.

The implications for teaching are to develop a safe environment is key for learning entrepreneurship. The educator needs to constantly work to maintain it. Therefore, monitoring students' attendance and engagement in the classroom and at the event is important. When students detach or go away from the learning environment the capacity to learn diminishes. It is necessary to spend some minutes every lecture and seminar to inform the students about the learning objective (s) related to the activity in question. As Neck et al (2014) have stated, by familiarising and fully informing the student the purpose of the exercises they will be more willing to be involved and fully participating in the activity. By experiencing enjoyment, students are more able to deliver as much as they can academically and personally. Furthermore, students will gain entrepreneurial skills if other modules at the business school during the first two years of the degree promoting these skills.

5.2.2 Practice of Empathy

All interviewees agreed that they have improved empathy using communication skills.

All three informants stated that they carried out research activities during the event specifically market research, which is useful to develop the app and to realise that the idea had commercial potential. The market research involved carrying out survey questionnaires and interviews with potential customers or users of the app. Further, all interviewees agreed that they carried out communication activities largely in order to ensure that every single person within the team was doing the correct activity at the correct time. It is observed that in order to create a good app, the participants need to develop empathy skills, which go in hand with good communication between the team members.



Source: Nvivo

Figure 2. Word cloud related to empathy answers

Practice *Empathy* tools are: role-play, negotiation games, external speakers and spaghetti tower. These exercises establish a rapport between the students and external persons invited to the classroom or when practicing role-playing in a business setting (Belbin, 2010), students can identify novel opportunities and risks associated to the problem examined in the seminars. According to Neck et al (2014) framework, this activity is intrinsic to any human skill involving a great deal of communications in order to increase the project chances of success and it is key importance to many activities related to entrepreneurship.

Neck et al. (2014) have stated that lack of empathy may lead to members of the team to create silos of knowledge and skills and eventually polarisation of the team, which at the end created an overall negative outcome for all the team members as some skills have not been fully exploited. Initial efforts should be made to make them part of a visible curriculum instead of finding them in exercises during the first two years of the degree.

5.2.3 Practice of Creation

The creation component was experienced by all the interviewed individuals realised what are they capable of in different skill sets. Sync the City event was a problem-solving activity to all informants, i.e. the creation of an app.

All interviewees mentioned that they used entrepreneurial skills during the event Sync the City. Further, all participants in this study agreed that they did not find any barrier for their innovative and entrepreneurial learning.

Practice of *Creation* during the Innovation Management module uses 4 tools used in the classroom: role play, spaghetti tower, building strategic networks/alliances and mix of summative assessment tools. Not surprisingly most interviewees perceived that they were not creative individuals, they have arrived at that conclusion because before taking the module Innovation Management no lecturer has made them aware, they possess or not creativity skills. Most interviewees assert they possess problem-solving skills as that is a key feature of the manager profession. However, they initially fail to conceive that the managerial profession is not only to solve problems but also to find problems to be solved. In fact, this is one of the key skills sought by multi-national corporations hiring graduates, which in most of the cases are not business students but from humanities, (THE, 2018).

Moreover, Neck et al. (2014) assert that it is important to nurture these skills to untap the student mental potential to succeed in business. Possession of these skills related to creativity can make their future jobs more enjoyable and productive. It is very important to make students aware from the beginning of their degrees if they are creative individuals. A basic voluntary creativity test can be completed by the students to make them aware of their possession would be an initial step. If a student is a creative person, it necessary to coach her/him or to provide advice on how to continue nurturing the skill within the university or outside of it.

5.2.4 Practice of Experimentation

Three out of six interviewees led a team and presented a pitch in Sync the City. Above three interviewees coincided that leading a team was extremely stressful and at the same time highly rewarding. Interviewees stated that were able to practise the skills gained and enhance in Sync the City in a classroom, all of them stated that it would not be possible to practice entrepreneurial skill only in a classroom. Overall, interviewees mentioned that they realised

that their idea was successful from the enthusiasm and work with other team members during the event.

Tools used in the module related to entrepreneurial skills are: external speakers, computer simulations, problem solving exercises, spaghetti tower, elevator pitches, business model canvas, predictive vs creative thinking, formative assessments, summative assessments including a feedforward session, mix of summative assessment tools and hackathon competition sponsored by a regional company. All interviewees perceived that experimentation using different tools is necessary to perform well during Sync the City. Neck et al. (2014) have examined that organised experimentation leads to produce successful ideas or confirmation of pieces of knowledge acquired by the students in any subject. Indeed, as they add, “it is through the experimentation that knowledge is acquired, tested, confronted and critically assessed in order to arrive to best outcome”, (Neck et al., 2014).

It is necessary to embed a constructivist approach to the teaching of entrepreneurship and more generally to business education. Strategic approaches lead to many inadequacies and problems in business settings. By implementing experiments and experiences in the teaching of business subjects a more natural and closer to the real life the subject becomes. In this way, students see the effect of their actions and it is easier to change direction to arrive to better business outcomes.

It is of key importance for **all** business modules delivered at the business schools to include “real world” practical examples, where the students can practice and eventually learn from their mistakes to minimise such outcomes when they are working in companies and organisations.



Source: Nvivo

Figure 3. All experimentation related questions' word cloud

5.2.5 Practice of Reflection

The entrepreneurial skills mostly used and nurtured in Sync the City by interviewees were: leadership, negotiation, team working and communications skills.

Interviewees will recommend to students in the business and computing school to take the module Innovation Management and most importantly to attend the event Sync the City.

Moreover, the advice provided by the interviewees to other lecturers in business schools is to encourage them to create this type of events as students gained or enhanced their entrepreneurial skills. It is also a very good to practice skills related to the knowledge acquired at the university. The practice of *reflection* has used these pedagogical tools: role-play, spaghetti tower, formative assessments, summative assessments including a feedforward session, mix of summative assessment tools and a competition sponsored by a regional company. Reflection is assessed with two pieces of summative assessment. Students deliver a presentation to the lecturer and a business manager sponsoring the competition about the improvement in terms of employability skills nurtured and used during Sync the City and the module. Neck et al (2014) and Brockbank and McGill (2007) have discovered that the reflection process by students must not be taken out of the big picture to teach entrepreneurial skills as they involve a social process to assess the effectiveness of the tools practiced. The reflection must be intentional and not optional. It is a key component normally overlooked by educators. The component of reflection is commonly used in modules in the business school. However, it is mostly detached from a concatenation of experiences acquired by students throughout the module (Boyd and Fales, 1983).



Source: Nvivo

Figure 4. Answers on practice on reflection's word cloud

Moreover, it is important to consider the views of the interviewees from the Anglo-Saxon context in the learning of entrepreneurial skills as they are more likely to understand and engage in the learning of such skills. Conversely, international students take a bit longer to process and take interest in the acquisition of these skills.

Concluding Remarks

Considering the evidence presented in this study several conclusions arise.

- i) The teaching of entrepreneurial skills is not common in UK universities. More efforts, especially academic need to be carried out to transform this subject into something useful for students.
- ii) By applying theoretical traits related to the implementation of teaching entrepreneurship by Neck et al (2014) provides an excellent boost to modules wishing to practice-based teach entrepreneurship. As Marton (1975) stated, as educators, we want our students to learn and not just on the surface, but in a deep, sustained, and meaningful manner.
- iii) The use of hackathons to teach entrepreneurship is key to boost student interest in the subject as well as to increase better outcomes for students after they have completed a degree. For instance, getting access to better-paid jobs, finding less difficulty to find opportunities to continue their professional development, improve their entrepreneurial skills needed for any job in different industries.
- iv) A hackathon by itself nurtures many entrepreneurial skills presented by Neck et al (2014) and examined in this study.
- v) Adopting a practice-based approach to teach entrepreneurship is a labour-intensive task compared to a traditional method. However, the benefits for the students and in reputational terms for the institution are enormous.

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